LAB NEWS
VOL. 37 NO. 4 SANDIA NATIONAL LABORATORIES MARCH 1, 1985

8th in US — Going for 1st

Sandia Bond Drive Set March 11-22

The 1985 US Savings Bond drive at Sandia is scheduled March 11 through 22. Dave McCloskey, manager of Engineering Analysis Department 1520, is chairman of the Savings Bond committee.

"We're entering the campaign with 89 percent of Sandians participating," Dave says. "The goal of the drive is to increase participation to 95 percent."

The campaign will be conducted along the same lines as successful past campaigns. VP coordinators will conduct the drive in their organizations working with directorate coordinators and canvassers.

All employees will receive a letter from President Dacey urging participation by all Sandians.

His letter also observes that Sandia is listed on the honor roll of corporate leaders in the national Savings Bond effort. Sandia places eighth in the ranking of the 104 organizations listed, just two percentage points behind the leader.

"Let's make Sandia number one this year," he urges.

All employees will receive a payroll deduction card along with information detailing the advantages of investing in a Savings Bond program.

"Most Sandians are very much aware that these days U.S. Savings Bonds are a very attractive investment," Dave says. "Since the variable market-based interest rate went into effect in November 1982, the interest rate has averaged 10 percent. Currently the rate is 10.94 for bonds held five years, which is very competitive with prevailing money market rates.

"There are significant tax saving advantages in buying bonds," Dave continues. "I buy bonds in the names of my two small children for future college expenses. I've filed tax returns in their names showing the intent to pay interest yearly in their zero-percent tax bracket. When they reach 18, they can cash bonds with no additional tax liability. The payroll deduction method makes the savings automatic, and nearly painless."

Dave points out that Savings Bonds have always offered particular advantages in saving for retirement. They are exempt from state and local taxes, and income tax on interest earned is not due until the bonds are cashed — a much lower tax bite in retirement and after age 65. Further, the money saved in taxes each year may be reinvested to make the bonds' effective earnings even higher.

DAVE McCLOSKEY (1520) heads Sandia's 1985 U.S. Savings Bond campaign, scheduled March 11-22.

"I agree with Mr. Dacey that it's fitting for a national laboratory such as Sandia, funded by the federal government, to respond enthusiastically to the US Savings Bond program," Dave concludes. "I'm very proud of Sandia's outstanding record, and we'll be working hard to make Sandia number one this year."

'Major Development in Microelectronics Technology'

Tungsten Shows Promise As Conductor

Extremely thin tungsten films may be the key to more reliable, higher performance, and less expensive silicon chips.

Lines made of polysilicon or aluminum now carry electrical signals from point to point on the tiny chips. Using tungsten films instead would reduce the number of circuit faults that increasingly occur as the drive toward greater numbers of transistors per chip forces feature sizes below one micron (1/100th the diameter of a human hair).

The advances are expected to be particularly helpful in designing and making very large scale integrated (VLSI) circuits. These circuits typically contain between 100,000 and a million transistors on a semiconductor surface area that is smaller than a fingernail.

It has been known for some time that films made of tungsten (a conductive, high-melting-point metal) can protect sensitive areas of a chip's surface during etching procedures and that they can help reduce electromigration effects, thus preventing shorts and open circuits (see LAB NEWS, July 6, 1984). However, until recently, microelectronics researchers have generally used less conductive materials, like polysilicon, or lower melting point materials, like aluminum, that have been adequate for large scale chips.

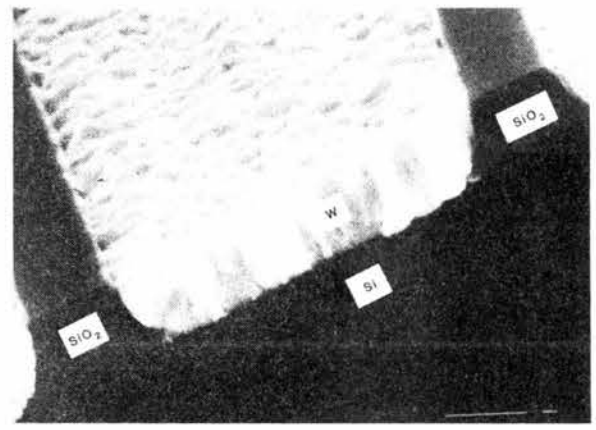
Substituting tungsten for traditional line materials sounds simple on the surface, but it was difficult to accomplish. The result is that the Center for Radiation-hardened Microelectronics (CRM) can now use low-pressure chemical vapor deposition (LPCVD) to deposit tungsten films selectively in desired areas and in microscopically small thicknesses.

In LPCVD, a gas containing tungsten is introduced into a quartz chamber, where it is maintained at low pressure and heated. Metal atoms contained in the feed gas immediately replace exposed silicon atoms on the wafer, forming a very pure, ultra-thin film that seals the silicon surface.

"It's important to limit the chemical consumption of silicon, which occurs during this initial stage in tungsten deposition, to 0.01 to 0.02 micron," says Bob Blewer of Microelectronics Materials and Processes Division 2147, the project leader. "When such films consume too much silicon, the chip's desired electrical properties can be altered or even destroyed.

"Once this initial layer has sealed the exposed silicon, we continue the deposition process until the tungsten builds to the desired thickness. However, until now, it has not been possible to maintain selectivity [depositing film only on predetermined areas without causing unwanted deposits to form nearby] when depositing films to greater thicknesses (up to one micron). I think we've now conquered both problems.

"The ability to selectively deposit one-micron-thick tungsten films in one-micron-deep contact holes offers a new method for achieving smoother chip surfaces," Bob continues. "Maintaining a flat surface after each step in chip fabrication makes it easier to create ICs (integrated circuits) consisting of several interconnected layers stacked on top of each other. Such stacking decreases the distance that an electrical



SCANNING ELECTRON MICROSCOPE cross-section image of a test structure shows a tungsten (W) film that has selectively deposited on the exposed silicon (Si) located between the oxide (SiO_2) lines. This film resulted from a new two-step chemical vapor deposition (CVD) process. The deposition reaction begins on the silicon. Then, because of the hydrogen reduction of the tungsten source gas in the CVD reaction chamber, tungsten eventually fills the gap between the oxide lines. The tungsten film is 100 times thinner than a human hair (longer line in lower right corner equals one micron).

(Continued on Page Four)

Antojitos

Terror in the Streets Of Tech Area I? Precisely. First of all, I have nothing against pedestrians. Upon occasion I have been known to practice pedestrianism myself. Certainly walking is nothing that consenting adults should be embarrassed about doing, even in pairs, even in public. And Sandia definitely condones the practice, even to the extent of making it the sole means, for many, of conveying themselves from, say, Bldg. 802 to Bldg. 821. I think I remember a pronouncement somewhere that "In the tech areas, pedestrians have the right of way."

The preceding is merely prologue. I protest those pedestrians who pace purposefully along the sidewalks of 9th Street or H Street, our two primary throroughfares, and then -- suddenly, without looking behind them -- veer 90 degrees and step out in the street directly in front of my vehicle. Right of way or not, that's asinine. I have not hit one yet. And I do not intend to -- I now keep LAB NEWS's little truck in low gear so, at 10 to 15 miles an hour, it makes enough noise that I'm hoping to dissuade the veerers. I recommend the practice. For those with electric vehicles, begin doing rhythmic riffs on the vehicle's horn -- better to be considered eccentric than condemned as a pedestrian-masher. •BH

* * *

KAFB Signs, This One Mobile On a Base-labeled delivery truck:

PIZZA TOO GO, FROM THE NCO.

* * *

Procul a Jove, procul a fulmine. (Latin: To be far from Jove is to be far from his thunder. This is the unofficial motto of the Sandias Livermore, Tonopah, and Pantex.)

Videotape Available

Panel Targets Career Growth

Career paths, perspectives on the role of mentors in career development, and the characteristics of success were topics covered by three Sandia managers and a supervisor who shared their views on career development with more than 70 staff members last month. The panel was sponsored by the Women's Program Committee (3511).

Panelists Dave McCloskey (1520), Ruth Whan (1820), Glen Otey (5160), and Maureen Baca (3521) collectively noted that their own careers have been marked by planned rotational assignments, by the opportunity to demonstrate one's capabilities to a wide range of supervisors and managers, and by diverse experiences that served to broaden their knowledge of Sandia and its mission.

"Flexibility and a willingness to continue learning while accepting new challenges are hallmarks of the 'comers,' " pointed out Ruth. The panelists agreed that commitment to excellence, the setting of high goals, continual practice of self development, versatility, and a realistic view of the opportunities are important steps toward career success, as defined traditionally.

"At the same time, there's nothing wrong with measuring 'success' in a highly personal and relative way," Dave noted. "You can measure your success by the enjoyment you derive from your work, by a relationship with co-workers that's characterized by respect and affection, or by a sense of performing a job that is important to society."

A videotape of the program is available from the Women's Program Coordinator in Div. 3511.

LAB NEWS

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SANDIA NATIONAL LABORATORIES

An Equal Opportunity Employer

ALBUQUERQUE, NEW MEXICO
LIVERMORE, CALIFORNIA
TONOPAH, NEVADA
AMARILLO, TEXAS

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BRUCE HAWKINSON, Editor
DON GRAHAM, Assistant Editor
NORMA TAYLOR, Writer
LOUIS ERNE, Photographer
GERSE MARTINEZ, Assistant Photographer
BARRY SCHRADER, Livermore Reporter

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Medical Corner

Hail to the Organ Donors

On Thursday, March 7, Carol Hutsell, a 28 year-old woman who received a heart transplant in Arizona in December 1983, will speak on organ donations from the viewpoint of a recipient. Also on the program is Marlene Schatz, executive director of Organ Procurement, who will speak on how to become a donor, how to recognize a donor, and how donated organs are handled. The program is set for noon to 12:30 in Bldg. 815 (outside the Tech Area).

Repeat of Two Popular Programs

The Presbyterian Heart Institute will repeat its "Heart Fair" in the lobby of Prebyterian Hospital on March 5 and 6 from 6:30 a.m. to 8 p.m. The fair offers an opportunity to talk with cardiologists, cardiac care nurses, dietitians, physical therapists, and counselors on ways to be good to your heart.

The Institute is also repeating its "Heart-to-Heart" education series on March 18 and 19 from 7 to 9:30 p.m. in the Presbyterian Hospital cafeteria. Health professionals will discuss topics such as diet, exercise, smoking cessation, stress management, and bypass surgery. To register call 841-WELL.

Take Note

John Daniel (8265) was recently commended for his outstanding contribution to the success of a manual for the Institute for Interconnecting and Packaging Electronic Circuits. John did the design work and many of the illustrations for the latest edition of the Guidelines for Acceptability of Printed Board Assemblies. The award was presented by Ralph Hersey, Jr., of LLNL, general chairman of the product assurance committee for the Institute, and Arnold Andrade (8176), Sandia's representative on the technical executive committee.

* * *

Arline Harrell (8400) has been named by the Livermore Valley Charter Chapter of the American Business Women's Association as its Woman of the Year for 1985. Arline has been at Sandia since 1976 and active in the ABWA since 1979, holding such offices as treasurer and president plus several committee chairs. She will be honored at the national ABWA convention in San Antonio, Texas, this coming October.

A TELESCOPE IN A TANK?

Even in our throwaway society it seems an expensive waste. Every time the shuttle rockets into space, the 30-ton external tank, once emptied of its liquid oxygen/hydrogen fuel, is jettisoned into the Indian Ocean — at $15 million per disposal. Cost-conscious officials at NASA have been looking hard to find alternate uses for the now-expendable, 154-foot-long, 28-foot-diameter fuel tank and have canvassed the general space science community for suggestions. Some schemes call for converting the empty silo-like tank into a space storage facility or an astronaut hideaway, but astronomer David Koch of the Smithsonian Astrophysical Observatory in Cambridge, Mass., thinks it could be turned into a giant telescope. Koch's plan calls for boosting the tank all the way into Earth orbit where the shuttle astronauts could then insert the component parts necessary to make it a super-sensitive gamma-ray detector with a 40,000-square-inch collecting area, more than 30 times larger than any such instrument now planned. (James Cornell in *Research Reports*)

Happy Birthday, SLRC!

Commit Yourself to a Worthy Cause – You!

If one of your New Year's resolutions is to indulge in the joys and rewards of physical exercise or participant sport, Sandia may have just what it takes to bring you ecstacy during the 10 months left in '85.

One year ago a formal Sandia Livermore Recreation Committee was organized; representatives were appointed from each directorate. "The committee has a healthy budget this year and we don't intend to let any of it go begging for lack of interest," says staff support member Don Charlesworth (8026). "But we do have to earmark a certain percentage for memberships in the Lawrence Livermore Lab Recreation Association."

Don pointed out some of the new committee's accomplishments to date: a Recreation Newsletter, published quarterly, with listings of upcoming activities and special discounts on entertainment; group trips and vacation packages; sponsorship of the Directorate Challenge Race; and a racquetball mixer set for March 2.

The committtee, always interested in innovative ideas for expanding Sandia employees' free-time activities, has installed a suggestion box in the Bldg. 912 vending machine area along with a bulletin board to publicize recreational events.

"For many years the company provided team uniforms and sporting equipment for a limited number of employee activities," Don continues. "Now the committee is becoming more involved in organizing and sponsoring new types of events for all employees, not only the team sport aficionados. But it continues to provide some funding support to 11 employee-organized activities."

Equipment is also provided for employee groups on organized outings. Available now for checkout through Don are footballs, basketballs, tennis racquets, and horseshoes, plus softball, volleyball, and badminton equipment. Use of the softball field, basketball court, and tennis courts on site is also coordinated through the committee.

The need for improved shower facilities for lunchtime joggers or after-hours exercisers has been partially fulfilled by showers and lockers in MO3 to complement the ones in Bldgs. 973 (for men only) and 913. The committee has proposed new locker room facilities in the basement of the Weapons Lab building, which will begin construction this spring.

In addition, the committee is pushing for a new softball diamond on the west perimeter to replace the one that will eventually be eliminated by a new Security Building. A proposal for a par (exercise) course is also being discussed.

Employees who may not be aware of the variety of recreational opportunities already existing should check the bulletin board in Bldg. 912. Some of the programs include bowling (12 Sandia teams play at Amador Lanes), fishing trips, golf leagues, snow skiing, coed softball, men's basketball, and tennis.

For more information, contact a directorate representative: Glenda Ross (8182), Linda Barncord (8235), John Lippold (8312), or Mary Clare Stoddard (8471).

SANDIA LIVERMORE NEWS

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Congratulations

Jean and Dennis Siebers (8362), a boy, Zachary Clark, Jan. 24.

Renee and Jay Keller (8362), a boy, Daniel Eugene, Jan. 27.

Dena and Jim Hackman (8274), a daughter, Laura Lynn, Feb. 7.

Denise Clay (8023) and Mark Koker, married in Stockton, Sept. 30.

Bill Ormond (8261) and Constance Porter, married in Oakland, Jan. 27.

Sympathy

To Donna LeMay (8273) on the death of her father in Livermore, Jan. 31.

To Mark Mintz (8443) on the death of his infant daughter in Walnut Creek, Jan. 31.

To Carl Holmes (8183) on the death of his stepfather in Buena Park, Feb. 14.

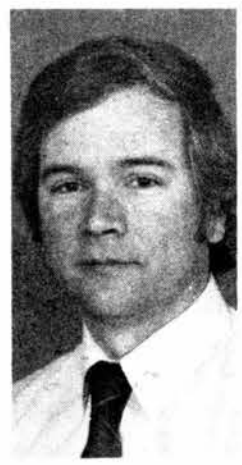
To Patti and Tabo Hisaoka (8274) on the death of their infant daughter in Pleasanton.

To Don Benthusen (8354) on the death of his father in Illinois, Jan. 30.

To Cindy Jensen-Miguel (8262) on the death of her stepfather in Livermore, Jan. 19.

To Paul Peaslee (8184) on the death of his mother in Castro Valley, Jan. 21.

Bond Drive Set March 11-22 At Livermore



Mike Pendley, supervisor of Computer Operations Division 8236, announces dates of the 1985 U.S. Savings Bond campaign at Livermore — March 11-22. As Sandia Livermore chairman this year, Mike seeks an increase in participation among Livermore employees.

Last year's bond drive ended with 89 percent participation by Livermore people.

Dave McCloskey (1520), chairman of the Sandia Savings Bond committee, will visit Livermore for the initial meeting with directorate representatives March 5.

POSING WITH EQUIPMENT available to employee groups are (from left) Don Charlesworth (8026), Glenda Ross (8182), Linda Barncord (8235), Mary Clare Stoddard (8471), and John Lippold (8312).

Fun & Games

Golf — The Sandia Men's Golf Association is holding an organizational get-together for members and prospective members on Tuesday, March 5, from 4:45 until 7 p.m. in the El Dorado Room of the Coronado Club. Membership in SGA is open to Sandians, DOE employees, approved contractors, dependents, and spouses. Refreshments will be served. Tournament schedules, a match play tournament, and league play will be discussed. Anyone interested is cordially invited to attend. More info from Al Maes (7815), 4-6478, or Mickey Shortencarrier (7223), 6-1662.

* * *

Running — The fourth annual Lenny Marquez Run, 15.5 miles starting at Old Laguna Pueblo, is scheduled Sunday, March 31. The run honors nine-year-old Lenny Marquez who has overcome severe physical setbacks in his young life. There are no entry fees. Runners will join a vehicle caravan at 7 a.m. at the Husky Truck Stop, Coors and I-40. The run starts at the Pueblo about 8 a.m. Bring a lunch. A picnic follows the run for participants, families, and visitors. Call Chuck Atencio (7632) on 247-8738 for more information.

* * *

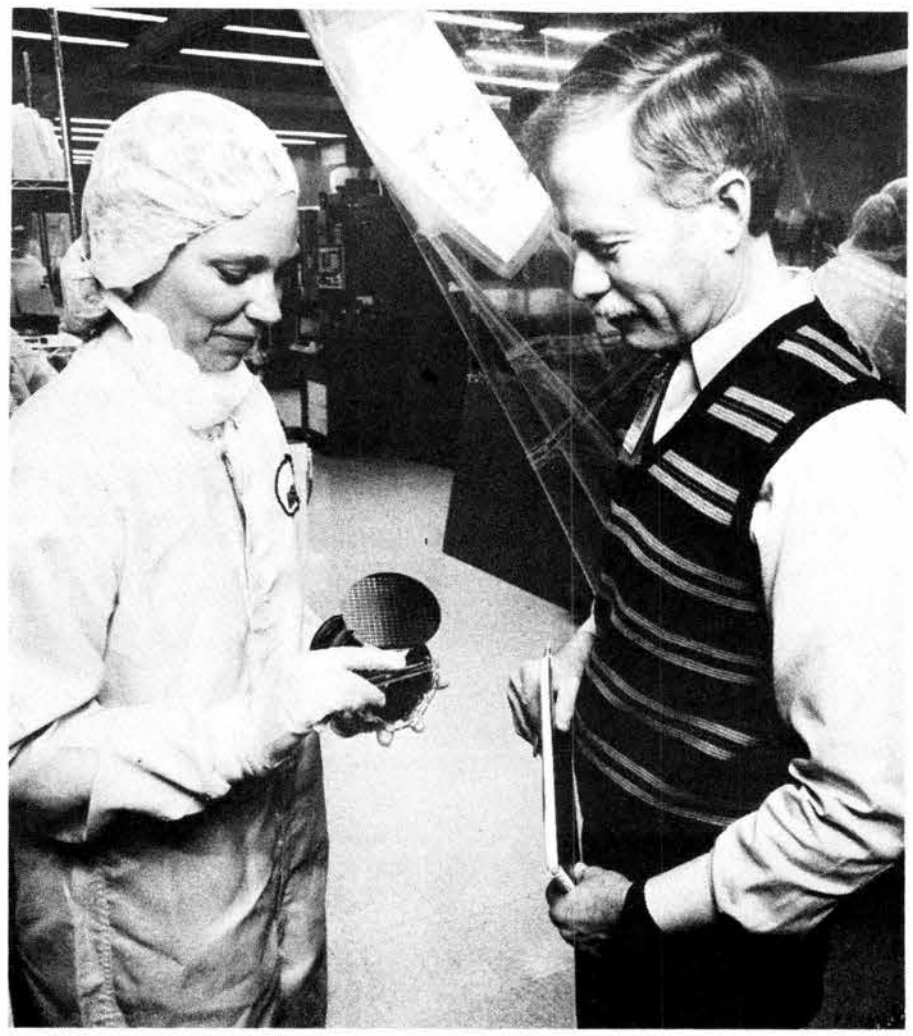
Running — The Albuquerque District Dietetic Association is sponsoring its fourth annual Fun Run on Saturday, March 30, at 9 a.m. The four-mile, TAC-sanctioned run begins at the Rio Grande Sporting Club, 2500 Yale SE. If you're not a runner, you can sign up for a one-mile walk. First 150 registrants get pint mugs. The fee is $5; pre-registration is required (call Susan Harris on 4-0713 for forms). All proceeds go to the NM Head Injury Association.

* * *

Bicycle Tour — The 13th annual Tour of the Rio Grande Valley will be held April 21. The tour begins at 6:30 a.m. at UNM parking areas near Cornell & Central. Registration is limited to the first 1500 riders or March 25 (whichever comes first). Entry forms are available at the LAB NEWS office (Bldg. 814). For more information, contact Bob Roginski (7553).

Welcome

Albuquerque
Jerry Etter (1622)
Charles Guthrie (2853)
Arnel Oczon (1622)
Stuart Van Deusen (1846)
Indiana
Richard Wickstrom (2514)
New Mexico
John Romero (7864)
Ohio
Mark Yee (2335)
Oklahoma
Michael Daily (2314)
Texas
Jose Arguello, Jr. (6332)
David Dionne (7831)



HOLDING A FINE-LINE test chip, used to evaluate and refine the selective tungsten deposition process, is Maren Tracy, process engineering technician with Kirk-Mayer, Inc. Bob Blewer (2147), the leader of the LPCVD tungsten project, holds back the plastic curtain that encloses the clean room area in Bldg. 870. The tungsten deposition equipment used in the project is in the background.

Continued from Page One

Tungsten Shows Promise

signal must travel to activate various parts of the circuits.

"Even though electricity travels at speeds approaching that of light, reduced distances materially improve IC response time," notes Bob. Also, narrower interconnects require less space and thus permit more active devices to be placed in a given area. It's similar to building an elevated freeway to speed traffic through congested neighborhoods.

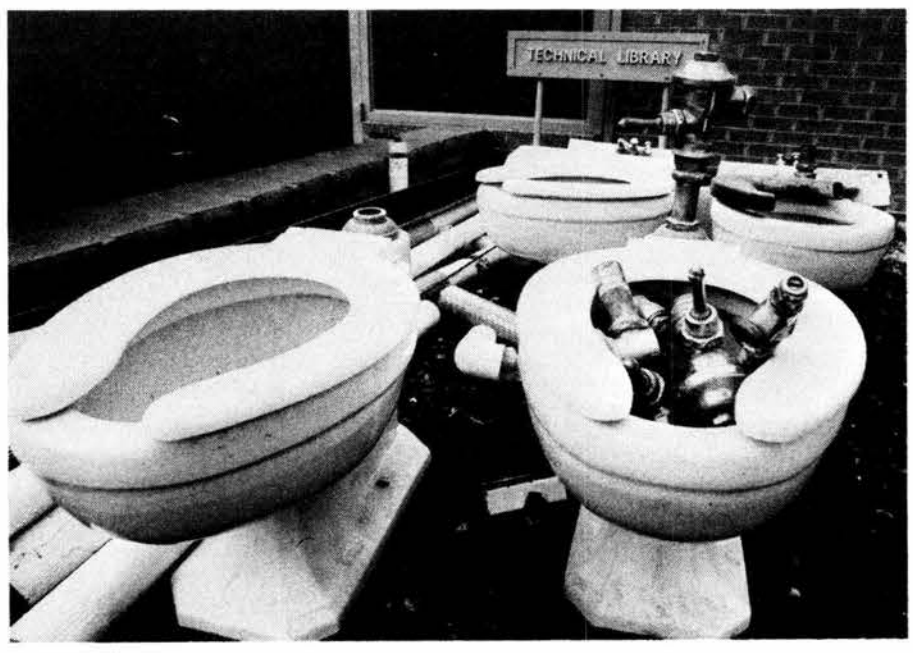
"The key to the advances is the precision and control with which we make the thin metal coatings on silicon wafers that are being transformed into chips," Bob continues. "Critical factors include the careful wafer pre-cleaning and control of the chemical environment, temperature, pressure, and feed gas within the LPCVD chamber.

"Basically, our research permits us to fine-tune the deposition processes in a way that achieves results that have not been attained in other laboratories."

The project team has now studied and analyzed the two relevant chemical reactions in detail by performing them in sequence, rather than simultaneously. As a result, unwanted deposition effects can be virtually eliminated. The team dilutes the source gas with excess hydrogen and also conducts special silicon wafer precleaning operations to ensure that tungsten is deposited only in the desired micro-areas.

"This work is a major development in microelectronics technology," says Bob Gregory, Director of Microelectronics 2100. "The demonstration that thick, as well as thin, tungsten films can be selectively deposited significantly increases the range of possible applications for tungsten in advanced VLSI circuit design and fabrication."

"The future looks very promising for LPCVD tungsten technology," says Vic Wells, 2147 supervisor. "More than 50 high-tech companies sent representatives to a recent workshop we sponsored on tungsten in microelectronics applications [see LAB NEWS, Dec. 7, 1984]. We expect even greater interest at the second meeting this October."



FLUSHED WITH PRIDE, the Tech Library announces some new ac*commoda*tions for its patrons.

Passivation Improves Polycrystalline Solar Cell

Photovoltaics researchers have long known that single cells of silicon are the most efficient means to convert sunshine directly into electricity. But single cells are expensive. If only polycrystalline silicon — much cheaper — could be made to work more efficiently...

It can. Don Sharp of Cleaning and Coating Technology Division 1831, Janda Panitz of Surface Metallurgy Division 1834, and Carl Seager of Electronic and Transport Phenomena in Solids Division 1132 have succeeded in processing polycrystalline silicon to improve its efficiency as a solar cell material.

The secret is hydrogen "passivation." That is, hydrogen is used to decrease the number of "traps" caused by defects and boundaries between grains in the polycrystalline silicon. The result is an efficiency in converting solar radiation to electricity as high as 14.5 percent (see related story).

Polycrystalline silicon is composed of many small crystals and can be made easily in the form of sheets or strips. Solar cells made from it are relatively cheap, but they are not so efficient as those cut from large single crystals of silicon; such cells can be relied on to achieve a 17 percent efficiency, and the theoretical maximum is about 22 percent.

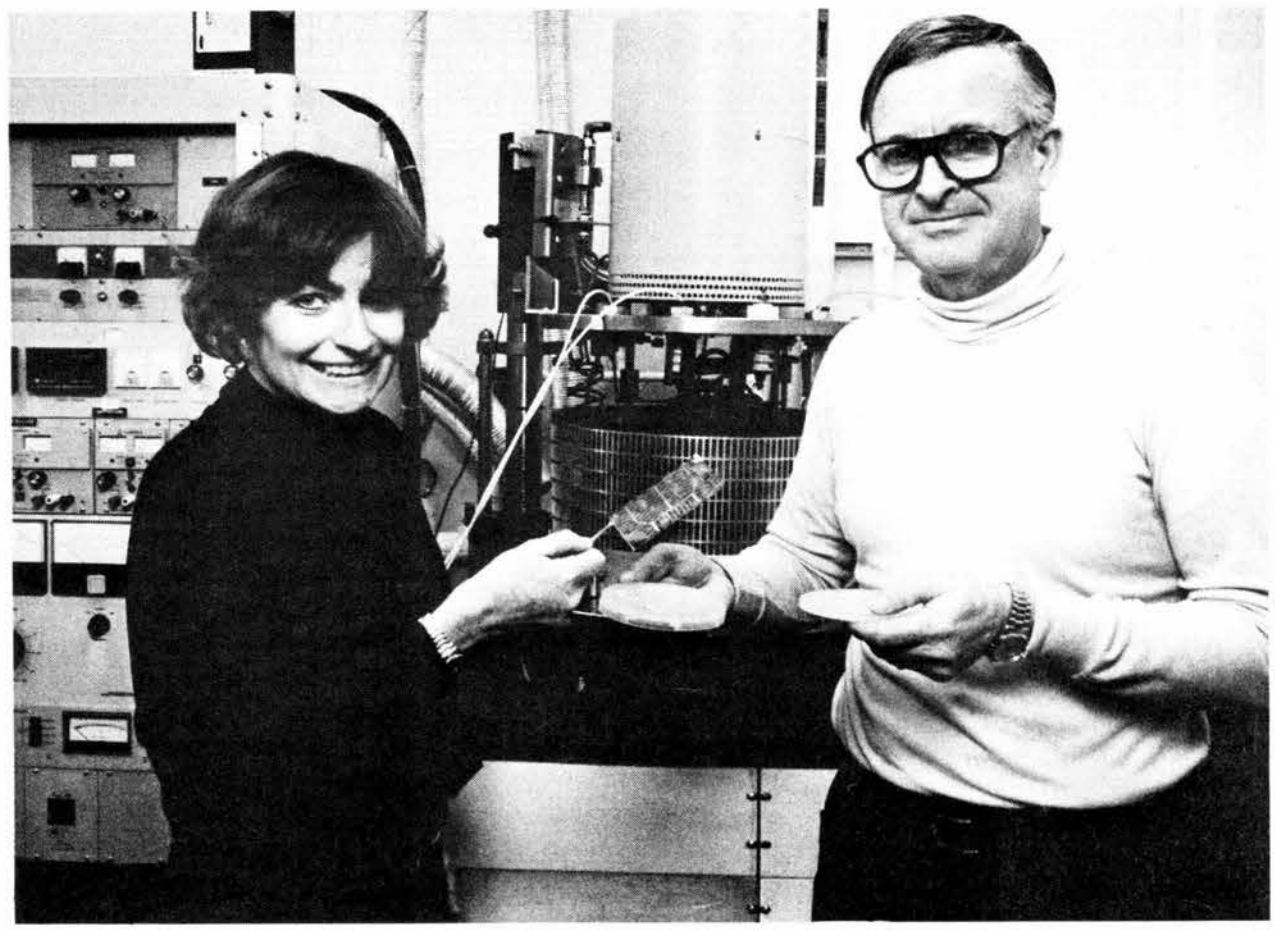
For polycrystalline silicon, on the other hand, the 14.5 percent solar-to-electrical conversion efficiency achieved by the Sandia team is a record. It means that under ideal laboratory conditions the material will produce almost 15 watts of electrical energy from each 100 watts of solar energy striking its surface.

In the passivation process, polycrystalline material is placed in a vacuum chamber and zapped with a beam of charged hydrogen atoms (ions). In a short time — four minutes or less — hydrogen penetrates deeply into the grain boundaries and defects. The resulting material behaves electrically very much like a single crystal.

Passivation works by getting rid of "traps" that snare electrons passing through the silicon and decrease its electrical efficiency. These traps are located at the grain boundaries and also in structural defects in the material. When an electron is trapped by a grain boundary or a defect, it's no longer available to help conduct electricity, and the electrical resistance of the material is therefore increased.

The improvement occurs because, during passivation, hydrogen atoms attach to places on silicon crystals that would otherwise trap electrons. Four bonds extend from each silicon atom. In a perfect crystal they are joined to other silicon atoms in what is called fourfold symmetry; however, one of the four bonds may be left stranded at the grain boundaries, forming a trap. When the trap is filled with a hydrogen atom, it ceases to exist.

Carl Seager and Dave Ginley (1154) first used hydrogen to passivate grain boundaries, and hence increase efficiency, in 1978; but the process proved to be lengthy and produced only modest improvements. Since 1982, Don, Janda, and Carl have developed a technique for using a high-energy ion beam to achieve deeper penetration of the hydrogen ions in much shorter periods of time. This results in faster and deeper silicon defect passivation and produces improved efficiencies.



POLYCRYSTALLINE SOLAR CELL developed by Don Sharp (1831), Janda Panitz (1834), and Carl Seager (1132; not shown) holds the record (14.5 percent) for efficiency in converting solar to electrical energy. Key is hydrogen passivation; the process decreases the number of traps in polycrystalline silicon, which is less expensive than single crystal silicon.

Mobil Solar Energy Corporation adapted the process in a joint experimental Sandia program funded by SERI (Solar Energy Research Institute); Mobil has achieved conversion efficiencies of more than 13.3 percent.

SERI continues to sponsor the present Sandia effort and has encouraged sharing of the passivation process with private industry.

Both Mobil and Solavolt/Motorola are currently using the process.

Congratulations

John (1543) and Alice Eichelberger, a son, Nathan William, Feb. 3.

Steve (7243) and Vinda Crawford, a son, Robert Steven, Feb. 2.

Alice (7537) and Michael Montoya, a son, Marc Matthew, Feb. 3.

Marguerite (21-1) and Erik Covington-Stout, a daughter, Jan. 31.

Ron Brown (2853) and Lana Berry married in Albuquerque, Feb. 14.

Charles Lloyd (2853) and Elaine Peterson married in Albuquerque, Feb. 14.

Steve Lautenschleger (2858) and Sharon Romero (7471) married in Albuquerque, Feb. 16.

Single Crystal vs. Polycrystals

Sunlight to Electricity Via Silicon

The ability of a silicon cell to convert solar energy into electrical energy varies greatly, depending on its form and on the way it is made and processed. The cheapest type of silicon, which is glass-like, with little or no crystal structure, can be 9-10 percent efficient. The next level better is high-grade polycrystalline silicon, which will perform at 11 or 12 percent efficiency, particularly if it is melted and re-solidified (annealed). Single-crystal silicon returns a reliably repeatable 17 percent efficiency; and the theoretical maximum is 20-22 percent (see LAB NEWS, April 27, 1984).

Polycrystalline silicon is produced in a number of ways, each considerably cheaper than single crystal growth. A single crystal, which is typically 2-3 inches or more wide and maybe a foot long, can be made into hundreds of useful slices, but these have to go through a diamond sawing process and then be lapped and polished. This is a time-consuming and expensive process, hence the search for a means of making a high-quality material by a different method.

Sandia researchers have been involved with the search for more than a decade. The recent improvement in the efficiency of polycrystalline silicon cells (see related story) has led to a prediction that making a solar cell that will produce, say, one watt of power will be as much as 40 percent cheaper with the hydrogen-passivated polycrystalline material than with regular, single-crystal silicon. This improvement still does not quite make solar energy economically competitive with conventional power sources, but it helps increase the attractiveness of using solar energy for special purposes such as powering remote beacons, radio stations, and receivers.

Unusual Vacation

Biking the British Byways

Many Sandians, it seems, spend their spare time in physical effort — jogging, running, hiking, and cycling, for example. Maybe it's all that brain work.

Bruce Dale (2629) and his wife, Patricia Rogers-Dale, are bicyclists. Early last fall, they cycled for about 400 miles covering three areas of England in about two weeks.

"We weren't really interested in covering a lot of ground," Bruce insists. "We're not really super-macho cyclists."

The Dales actually spent four weeks in Europe. They spent their first week in Norway, then took a ferry from Bergen to Newcastle-upon-Tyne, England, and a train to Hexham in Northumbria.

"We took trains a lot," Bruce says. "We could put the bicycles on trains at no extra charge, and we really didn't want to ride through the heavy industrial areas."

On the train from Newcastle to Hexham, a fellow cyclist recommended they buy a special large-scale topographical map. And they did.

"I wish I'd seen the map when we were planning the trip," Bruce explains. "I had no idea we'd be traveling through mountains. We thought that mountains in England couldn't be a problem. They were though, much more than we thought."

Their favorite part of the trip took them from Hexham to York through Northumbria and northern Yorkshire. But before setting out for York, Bruce and Patricia spent two nights in Hexham and did some sightseeing.

"Hexham is an old abbey town with a medieval, high Gothic abbey still there," Bruce explains. "There was a seventh century Saxon crypt underneath. Mind-boggling! Most Americans have no idea how really *old* things can be because we live in such a young country."

Bruce and Patricia thought that Northumbria with its small villages, stone walls, and country churches — and mountains — was "really pretty." They walked their bicycles up the mountains and rode down.

The highlight of the trip for them was visiting James Herriot country, the area around Barnard Castle in northern Yorkshire. *All Creatures Great and Small* is the Dales' favorite television show, and they've read all of Herriot's books.

"That's why we went to northern England," Bruce explains. "The northern part of Yorkshire is just like what you see on the TV show. We even met a farmer who knows Herriot, and he says that Herriot is a real person — and alive and well.

"We were really lucky with the weather," Dales continues. "We had overcast days, but about only two days of rain." That was plenty — their nylon rain ponchos leaked.

"After we got to York, we headed for the flat country as soon as we could. Otherwise, I'd've had a rebellion on my hands," Bruce says.

From York, the Dales put themselves and their bicycles on the train again and headed for Cambridge, then did a loop southeast of Cambridge into East Anglia.

"We didn't like East Anglia as well as the North," Bruce says. "It's less genuine, more sophisticated — sort of like suburban Connecticut. There are more professors, more consultants, and it's more affluent because the university is nearby. And the terrain was easier, but the traffic was worse!" Bruce explains.

They did enjoy "small story-book-type places" such as Finchingfield, "but even these places had a lot of hype."

From Cambridge, Bruce and Patricia took another train to Salisbury and cycled along the edge of the Cotswolds to Stratford for the final leg of their cycling journey. What impressed them most about this area were the Stonehenge-like configuration in Avebury.

"They were Druidic, prehistoric, monolithic things — different in feeling from Stonehenge, which is more compact," Bruce says. "Cycling along, you'd see stones standing upright like on Easter Island. To get the full picture, you have to see them in an aerial photo. They're more impressive than Stonehenge — and much more eerie."

After a train trip to London, they parked their bicycles for a sightseeing week. In addition to all the usual tourist sights, they took a walking tour with a guide (a retired newspaper man) whose advertisement they found in the newspaper.

He showed them places that aren't in the London guidebooks — for example, the "legal" section where they visited the civil courts and saw the office of the Queen's solicitor.

The highlight of their day with the guide was a lunch in a workingman's pub. "It was a real workingman's pub, all right," Bruce says. "The cockneys were there with their carts and all. The food was real working class food, too — okay, nothing special. That guide sure knew that neighborhood."

Bruce says they didn't do anything special to prepare for the trip except for the usual weekend cycling jaunts. Bruce rides his bicycle to work about three times a week, weather permitting. His advice for a cycle trip — "Get to know your bicycle before you go. Get some experience fixing it. Then you'll know what to bring."

Bruce took along a light weight tool kit and even a spare tire in case they needed one in a place were a tire wasn't available. "Maybe I'm a pessimist. Maybe I'm just more of a Boy Scout than other people, but I think that if you have it along, it won't go wrong," Bruce says.

Patricia's bicycle is an American Trek. Bruce's is a French Bertin, a touring model.

Bruce and Patricia stayed in bed and breakfast places (B & B's) almost all the time. "Almost without exception, the people were all friendly in the North, and the breakfasts were big, but the farther south we got, the less friendly the people were, and the smaller the breakfasts got," Bruce says.

A typical day would see them on the road by 9 a.m. They'd snack along the road and then stop for tea about 4. "We loved it,"

FINCHINGFIELD is one of the picturesque villages the Dales enjoyed in East Anglia, even though Bruce says the place "had a lot of hype." They also found the traffic in East Anglia to be worse than anyplace else they traveled.

EVEN CYCLISTS must ride on the left side of the road in England. Patricia, both her bicycle and herself decked out in full gear, waits for Bruce on the side of the road in the Cotswolds.

CHECKING THE TOPOGRAPHICAL MAP and having a snack, Bruce hopes there will be no more mountains on that day's ride through North Yorkshire.

Bruce says. "Tea is England's greatest contribution to Western Civilization." After tea, they'd find a place to stay and have a late dinner.

As one might imagine, their clothing list was small. They each had panniers (bicycle saddlebags) and a handlebar bag. "We were living out of about 2200 cubic inches of space each," Bruce explains.

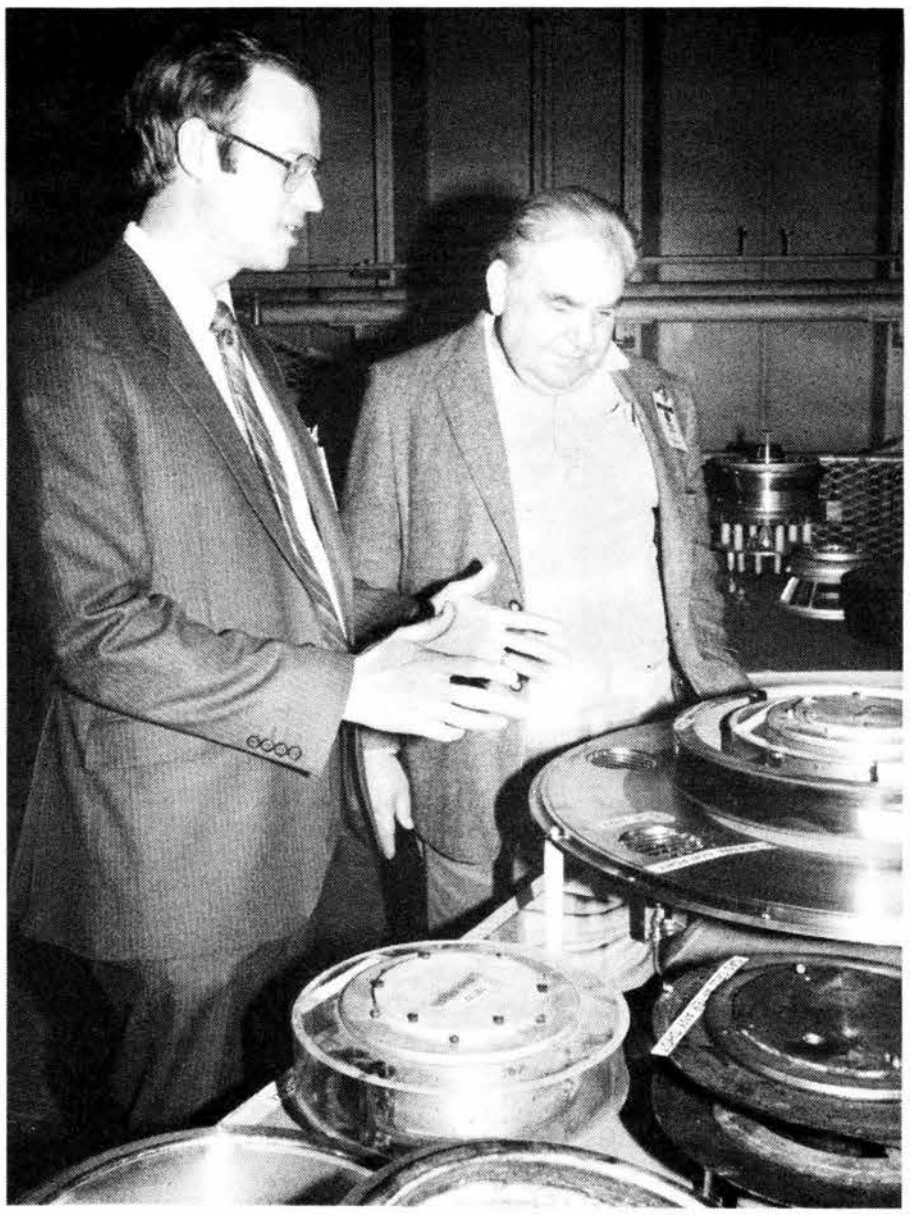
They washed clothes only occasionally. There was always a chance the clothes, especially the chamois-lined cycling pants, wouldn't dry. "We got a little funky," Bruce adds. They each took one outfit of dressy clothes.

Logistics: Airfare from Albuquerque to London was about $700 per person, round trip. The flight from London to Norway was extra. Arrangements were made through a travel agent here. The B & B's averaged about $21 per night. Cost of the entire trip for both: about $3500.

Don't Give an Inch

"In 1975, the Metric Conversion Act became law and the US Metric Board was set up to encourage voluntary conversion to the metric system. America's leaders said it was time the country walked in step with the rest of the developed world. [The US is the only country still using the traditional method (the British system) of measurement—feet, inches, miles, pounds, gallons, and so on.] Today, the big push has fizzled. The US has not converted to the metric system. The nation's schools introduce the system to school children, but do not emphasize it. The general public balks at any attempt to make the change...'There are two ways to teach metric,' [says Priscilla Norton, US Internatl. Sch. of Education]. 'The first is conversion, where you learn how to convert feet to meters and so on. The second is concept, where you learn metric as you first learn what a foot and an inch are. You learn what a meter is. The most effective way to learn is by concept, but we don't do that. We teach conversion. It's very hard to learn metric well when you don't have to, and you don't have to in our society—we still think in feet and inches. When we need to go to metric, we will. But right now we're looking inward as a country and we don't feel the need to conform to the rest of the world.'"

USA Today, June 84



SCALING THE TECHNOLOGY for ion beam focusing from PBFA-I to PBFA-II with the large ion diode shown was the subject of discussion between Adam Klein (right), counsel, House Armed Services Committee, and Pace VanDevender (1200). In addition to Klein, Aaron Edmondson, staff assistant, Subcommittee on Energy and Water Development, House Appropriations Committee, and John Mansfield, professional staff member, House Armed Services Committee, reviewed Sandia programs recently.

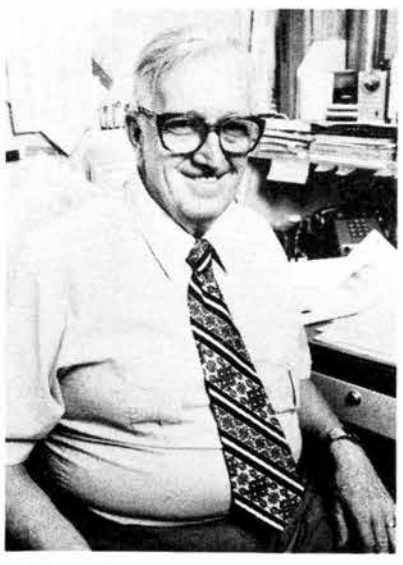
Sympathy

To Hank Mullin (5123) on the death of his wife in Albuquerque, Feb. 11.

To Dolores Pacheco (6228) on the death of her brother, Feb. 15.

To Felix Garcia (7818) on the recent death of his father in Albuquerque.

Retiring



M.J. (Red) Madlener (2531)

Ernest Cordova (7482)

Ray Powell (3000)

Dave Schafer (7171)

Bob Fox (2543)

Bill Hereford (5142)

Take Note

A nation-wide teleconference on "CAD/CAM/CAE: Are You Ready?" will be broadcast on March 15 from 7:30 to 11:30 a.m. at UNM. Sponsored by UNM, the Milwaukee Area Technical College, and the National Computer Graphics Association, the teleconference is structured for persons currently employed in manual design, drafting, engineering, manufacturing, or production who are or will be affected by automation technology. Originating in Milwaukee, the live broadcast will be picked up by the WESTSTAR IV satellite and downlinked to 150 nation-wide sites. Brien Bopp (2857) and Don Peterson (2814) will participate in the teleconference. Sandia has prepared a 12-minute videotape on traditional methods versus automated methods to be used during the engineering segment. Brien will be present at the live presentation; Don, who worked on the solid modeling portion of the video, will be linked to the audience by telephone to answer questions.

Registration deadline is March 4; individual fee is $35, and institutional rate for up to 12 persons is $300. For more information, contact UNM Continuing Education, 805 Yale NE, or call 277-3751 or 277-9060.

* * *

The Stanford Linear Accelerator Center will hold the 5th US Summer School on High-Energy Particle Accelerators from July 15-26 at the Center. The School offers courses on the fundamentals of accelerators, storage rings, and particle beams. The program also offers a symposium on research in the growing number of accelerator-based sciences including high energy physics, nuclear physics, light source physics, heavy ion physics, free electron laser physics, and the physics of high intensity beams.

Registration forms (April 15 deadline) are available at the LAB NEWS office, Bldg. 814.

* * *

"Secretary Speakout '85" will be held at the Convention Center on March 12-15. Sponsored by the Professional Secretaries International (PSI) and hosted by the Albuquerque Chapter, Speakout encourages secretaries to advance their professional aims by speaking out freely on issues relevant to their interests. Secretaries from the US and Canada are expected to attend. Members of the Albuquerque Chapter will serve as ushers, registration committee members, and guides for different tours. A Night at the Wool Warehouse is being sponsored by the Albuquerque and the Rio Rancho Chapters on March 13. Reservations for this evening entertainment are $22 and should be mailed to Geraldine Teerers, 12013 Apache NE, Albuquerque, 87112, no later than March 4. Registration for the four-day program is $225 for non-PSI members and $175 for members. For more information, contact Sadie Hesselden (7540).

* * *

Experts from Sotheby's — art auctioneers and appraisers — New York City headquarters will be in Santa Fe on March 6 under the auspices of the British American Theatre Institute to provide an appraisal service. Take your portable items to the Bank of Santa Fe's main offices at 241 Washington Ave. from 10 a.m. to 4 p.m. for verbal appraisal at $5 per item. Sotheby's will also provide contracts for written appraisals of up to three items at the basic cost of $50. Between 5 and 7 p.m., the British American Theatre Institute is sponsoring a benefit cocktail party with Sotheby's at the same location. The donation of $35 per person is tax deductible and will include, in addition to cocktails and hors d'oeuvres, free verbal evaluations of up to three small items that can be brought to the bank that evening. For more information, call 1-983-6713.

* * *

RESOLVE of New Mexico, a non-profit, charitable organization for infertile couples and professionals in the field, will present its fifth annual symposium, "Insights into Infertility," on March 2 from 9 a.m. to 5 p.m. at St. Paul's Lutheran Church on Indian School Rd. (just west of University). Call RESOLVE at 242-4420 to preregister ($30) or for more information.

* * *

The Hospice program at Hospital Home Health Care provides physical care and emotional, social, and spiritual support for patients with limited life expectancies and for their families.

Friends of Hospice volunteers and other supporters will host a "Daffodils for Hospice" Day on March 22. Daffodils will be on sale in the lobbies of the hospitals in the Presbyterian and St. Joseph hospital systems and at the Crossroads walkway on 4th Street downtown. Proceeds from the daffodil sales will benefit the Hospice Patient Care Fund.

The daffodils will be sold for $5 per bunch of 10-12 flowers. The flowers will be delivered to offices that order 15 bunches or more. Call by March 8 to reserve your flowers for delivery. For more information, call Lezlie Ann Schubert at 842-5967.

* * *

The American Lung Association of NM is offering respiratory disease self-care classes for adults with any chronic lung disease. Classes will be held on Saturdays, March 2-30, from 1:30-3:30 p.m. at the Lung Association office, 216 Truman NE. For registration or more information, call the office at 265-0732 or Mary Callahan at 292-8341.

* * *

The Education Forum of NM, an organization of lay citizens and professional educators working together to study and act on issues that promote quality education in the state, will hold its first annual meeting at the Regent of Albuquerque, March 16, 9:30 a.m. to 1:30 p.m. Featured speakers will be David Colton, Dean of Education, UNM; and Martin Berman, Executive Director of the NM Community Education Association. The agenda includes background information, strategic planning sessions, and a business meeting to elect a board of directors and to plan a membership drive. To register ($9.50 includes lunch) or for more information, call acting president Meg Wente, 299-5274.

* * *

The board of directors of the Sandia Laboratory Federal Credit Union recently appointed members to the supervisory committee. They are Charles Craft (6445), Robert McIntosh (142), Ernest Apodaca (7481), Jan Levin (3543), and Jerry Wackerly (8423). The committee named Craft as its chairman.

* * *

The Bumblebee Toastmasters invite anyone interested in improving public speaking skills to join their group. They meet Tuesdays from 11:30 to 12:30 in the theater of the Atomic Museum. For more information, call Dave Medina (131), 4-3505, or Ginny Eckhart (2833), 4-1947.

* * *

Want to learn dances from countries such as England, Sweden, Turkey, Israel, and Bulgaria? Join the Albuquerque International Folkdancers, a newly created recreational folkdance group. The group dances at Carlisle Gym on the UNM campus (Yale Blvd. north of Central) on Saturdays from 7 to 10 p.m. All persons interested, especially beginners, are welcome; dance instruction is held from 7 to 8 p.m. Wear only approved dance shoes or white-soled gym shoes. Cost is $1 per person. For more information call Jane Diggs (6227), 4-5203.

* * *

Workshops to help high school students find meaningful summer employment are underway at the Career and Vocational Counseling office at 7101 Prospect Place NE. Three two-hour sessions will focus on personal abilities and interests, learning to fill out applications and compose resumes, and learning job-seeking skills. Prudence Davis, a career and vocational specialist, will conduct the workshops. Cost is $40; preregistration is required. Call 883-4513 for more information.

* * *

Retiring this month and not shown in LAB NEWS photos are Jim Craig (2515), Beryl Hefley (1601), Harrel Killebrew (3612), Clinton Purdue (2313), Eddie Romero (3425), Norman Scott (3462), and David Sanchez (3435).

* * *

Cornucopia Adult Daycare Center is taking orders for homemade tamales — red chile pork, green chile chicken, or fruit-nut sweet — at $8 a dozen. The proceeds from the sale, which lasts through March 3, will support services for seniors and handicapped adults. Order tamales by calling Max Martinez (1100) on 292-3107 or Cornucopia on 877-1310.

Death

Grace Downs of Purchasing Services Division 3733 died Feb. 20 after a long illness. She was 64.

She had worked at the Labs since March 1971.

Survivors include her daughter Debbie (5200) and two sons.

feedback

Q. We currently have a "Survivor Annuity Election" in the retirement plan, but there is not any consideration for our spouse in our medical/dental plan. The fact that they are allowed to start paying for this coverage is of little comfort. Why is a spouse not considered more highly in respect to the health and dental plans?

A. The medical coverage provided Sandia employees includes six months of company-paid coverage for the surviving spouse and eligible dependents of a deceased active employee or retired employee with either 15 years service or 10 years service at age 65. Before the end of the six-month period after the death of an employee, the surviving spouse may elect to continue coverage by enrolling in the Surviving Spouse Continuation Plan, which includes eligible dependent children. The surviving spouse must assume the cost for this group plan, offered at a group rate, which is significantly lower than the rate for individual coverage. The continued medical coverage for surviving spouse and dependents offered by Sandia is like that provided by AT&T and is a part of the total competitive benefit package.

Dental coverage for the surviving spouse and eligible dependents stops on the last day of the month in which the employee dies. Sandia's Dental Expense Plan has the same benefit structure as that of AT&T and is competitive with industry standards.

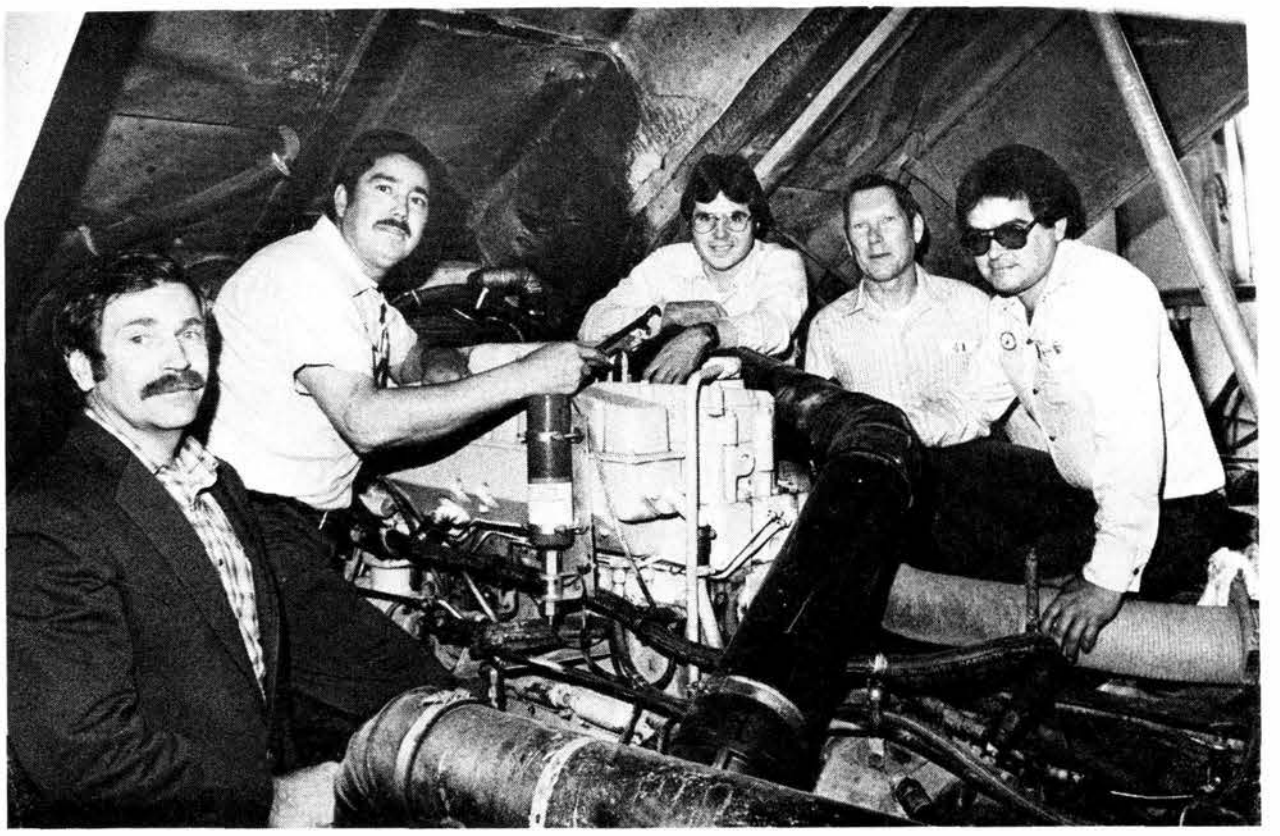
Regarding your comments concerning the Survivor Annuity Election in the retirement plan, Federal law requires the election or declination of a survivor annuity in pension plans and, if elected, the annuity feature is paid for by the participant through a reduction in pension.

J.R. Garcia - 3500

Q. Has Sandia considered establishing company-mail pickup stations at a few locations — perhaps near major building complexes — where the mail would be picked up frequently (perhaps once an hour)? This would expedite the handling of urgent mail and would also save some employee time now spent in handcarrying especially important mail to the Mail Room.

A. We have examined your suggestion from two points of view: Would it reduce the effort in the Mail Room and thus reduce the force, and would it speed the delivery of mail? On the first point, we assume you mean to add these pickup stations to the present system. This would add to, rather that subtract from, our mail clerk force. On the second point, it would speed some mail. We have no experience to judge by, but we estimate that it would be a small fraction of the mail we now pick up. Since we would have to add at least one person and a vehicle to accommodate these pickup stations, we feel the expense outweighs the benefits.

H.M. Willis - 3100



UNDER THE HOOD of a Marmon tractor is the proper place to find the first group of Sandians to complete the Motor Pool's on-the-job Mechanical Training Program. It takes six to seven years for trainees to become proficient in the many skills necessary to maintain the fleets of vehicles and other equipment required by Sandia and the Transportation Safeguards Division. From left: Bill Rose, supervisor of Section 3421-2 and an administrator of the program; graduate Eloy Garley (3421-1); graduate Larry Lesperance (3421-2); Bob Barton, supervisor of Section 3421-1 and the other administrator of the program; and graduate Joe Perez (3421-2).

Colloquium Report

New Planetary Missions Set

Congress now thinks that exploration of the solar system is a good thing and should continue: funding has been approved for missions to Mars, Venus, and the Jovian system — 14 in all.

"Picture enormous fleets of spacecraft all sending vast amounts of data back at practically the same time," said Harold Masursky of the U.S. Geologic Survey in a recent talk. "After a long period of famine, we're going to be faced with such a feast of information that we probably won't have enough people to process it."

Masursky's main topic was about recent geologic developments on Mars and Venus. Nine areas on the Red Planet have been chosen as candidate sites for spacecraft landings that will return rock samples to earth. One of these is on the slopes of Olympus Mons, the largest volcano in the solar system (23 kilometers high). Other spacecraft are planned to land in the polar regions to recover pristine ice samples; the techniques developed for such a task could be used to recover a chunk of matter from a comet in the not-too-distant future. All of the Martian sites offer a broad spectrum of rock types and ages in relatively small regions. The rock samples will be collected by rovers — robot vehicles that will explore areas around, and a distance from, the lander. These regions will be studied in detail by the Mars Geoscience Climatology Orbiter in 1990 in preparation for final lander/rover site selection.

Venus also offers exciting — and more challenging — possibilities. Although practically a twin of Earth, Venus has developed in radically different ways. New data recently acquired from the cloud-shrouded planet show a dramatic change in the sulfur dioxide content of its upper atmosphere — a change similar to (but 100 times greater than) that produced in 1980 by the volcano El Chichon in southern Mexico. These and other data obtained by U.S. and Soviet spacecraft suggest widespread volcanic activity on Venus.

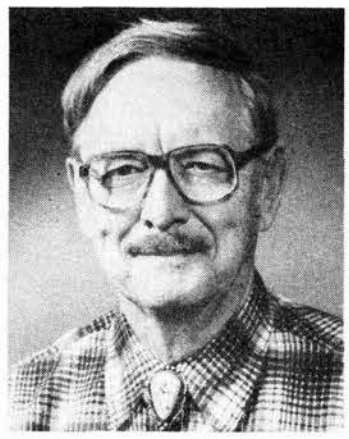
Masursky said that rock-sample recovery missions are also planned for Venus — a somewhat awesome task given the extremely hostile environment of the Venusian surface. He intrigued Sandians by suggesting that the technology developed for launching missiles from submarines could be adapted to a mission that includes launching a rocket with rock samples from the surface of Venus: the rocket must ascend through the dense Venusian atmosphere (roughly comparable to water) and fire its second engine when it escapes that atmosphere, just as a sub-launched missile fires its second engine when it reaches the air.

Data from the Soviet Venera 15 and 16 probes have been excellent, says Masursky. Although the Soviets have been good about sharing their data, they've been quite byzantine about it. He described how they have distributed photographs of the Venusian surface at international meetings, but with the admonition that they not be published anywhere because they haven't been officially "released." Even when the same pictures have appeared in a widely circulated English-language Soviet magazine, the Russians still insist that they are not yet "released."

However, in spite of such Soviet bureaucratic wonderments, the exchange of valuable information goes on. In December, the Russians will launch a spacecraft that will intercept Halley's Comet; before that historic rendezvous, it will fly by Venus and launch two landers — an "incredibly ambitious" project in which American scientists are cooperating.

MILEPOSTS
LAB NEWS

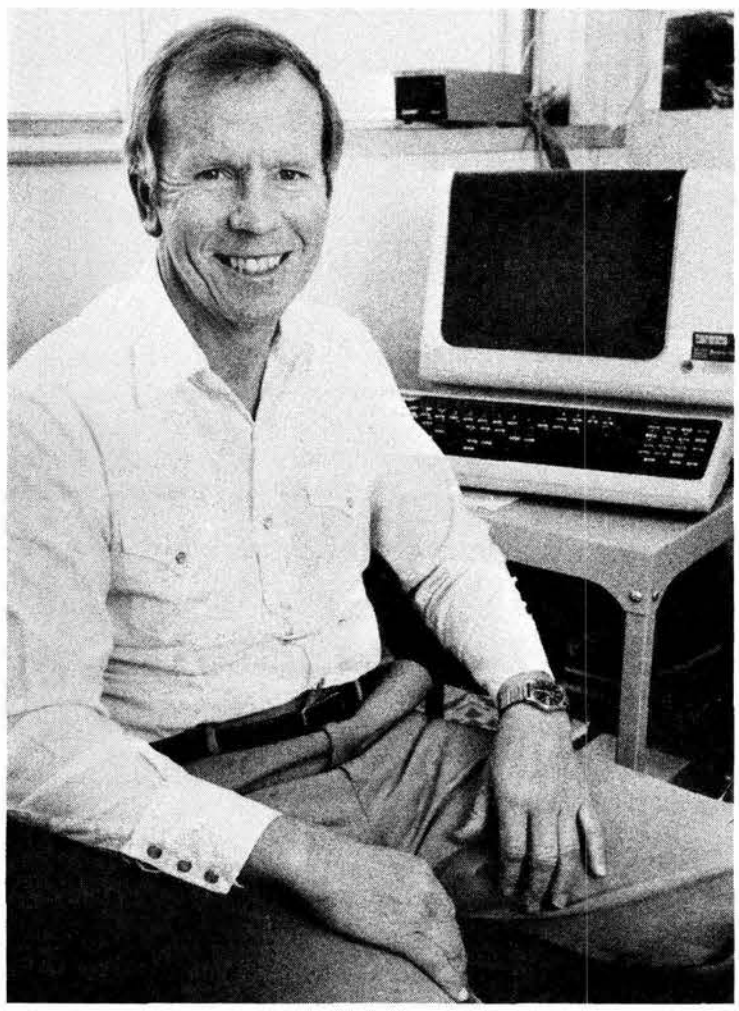
MARCH 1985



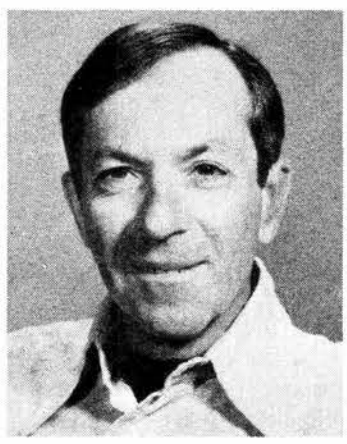
Jerome Durrie (5125) 35

Nadine Sheppard (8023) 25

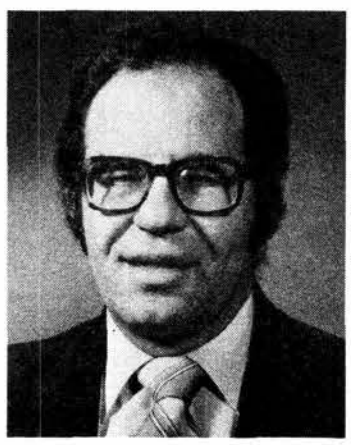
Gladys Kimberline (8264) 25



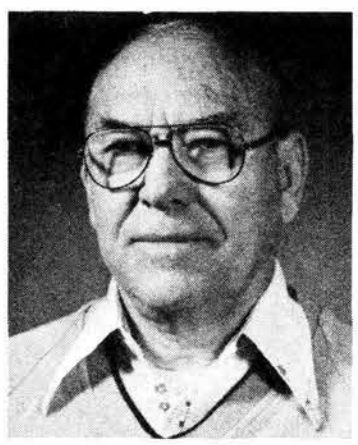
Glen Whiting (5161) 25



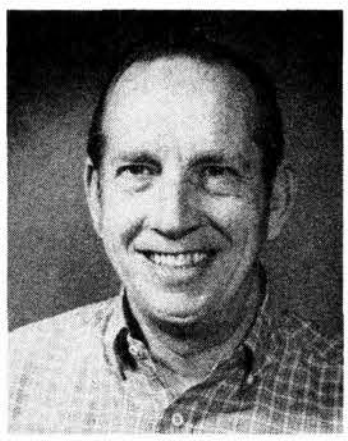
Howard Tessler (5214) 25



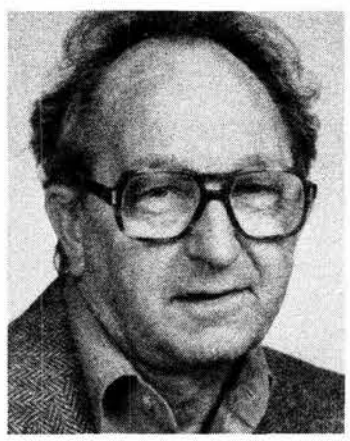
Norman Grandjean (6321) 20



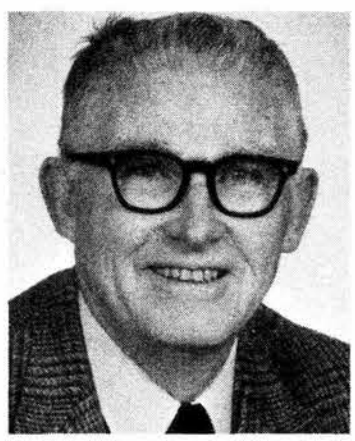
M.L. Heisler (7543) 30



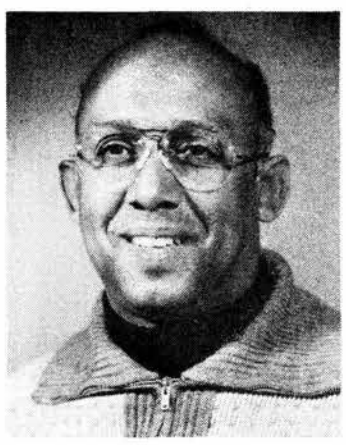
Robert Nagel (2335) 25



Moe Houk (8161) 20

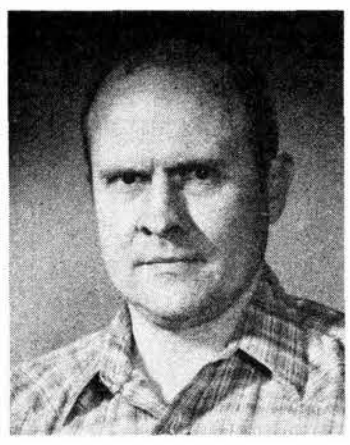


George Mincks (8257) 35



Roy Palmer (2124) 20

Edgar Richardson (7265) 30



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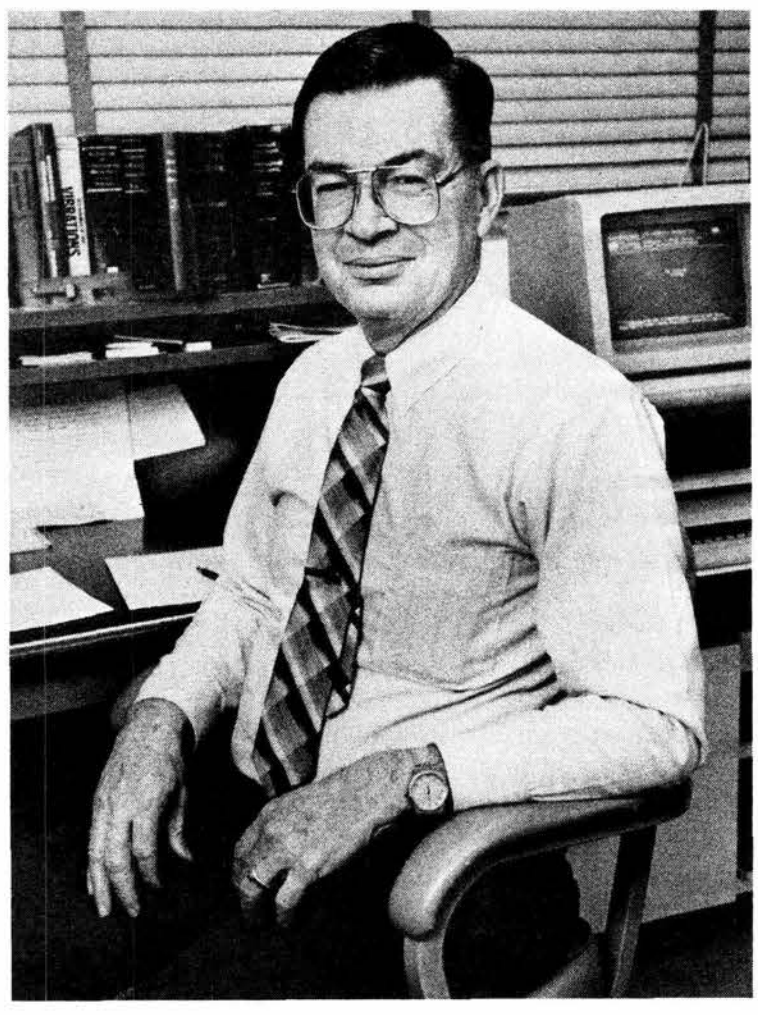
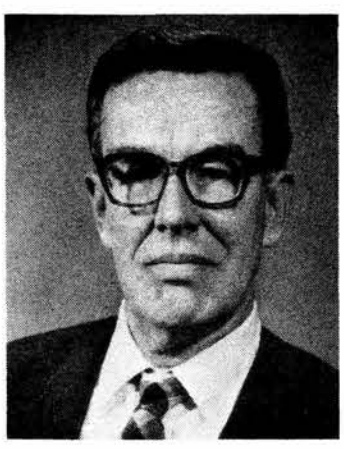
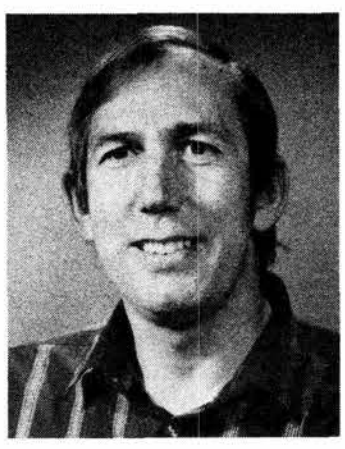


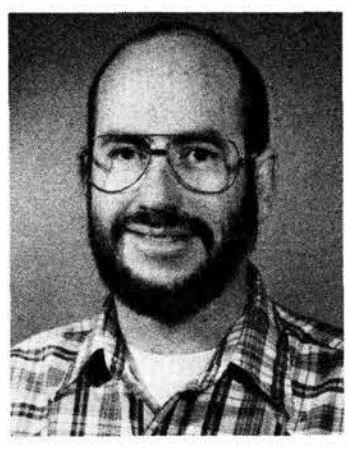
Bob Alvis (5153) 25



Charles Radigan (7658) 30



Barry Hansen (6224) 15



Thomas Ray (7651) 15

volunteers in action

HEALTH FAIR NEW MEXICO will be offering health education programs and screenings at sites in Albuquerque and New Mexico during this year's event, March 14-30. This second annual fair is expected to attract 12,000 participants.

Medical volunteers are needed for training, supervising, and counseling. Non-medical volunteers are needed for clerical support, registration, and screening.

If you would like more information, call Karen Shane (4-3268).

Events Calendar

March 2-3 — NM Gun Collectors Assn. Spring Gun Show, Ag. Bldg., State Fairgrounds, Sat. 8 a.m.-6 p.m., Sun., 8 a.m.-4 p.m. Admission $1.50 (50 cent discount with any local newspaper ad or clip this notice), children under 12 free when accompanied by adult.

March 3 — Bach's Passion, 3rd concert of the NMSO's Sinfonietta Series: Afternoon Delights; 3 p.m., First United Methodist Church, 4th & Lead, 842-8565.

March 3 — Movietime at the KiMo: Movies by Great Directors, "Beggars Opera," Peter Brook (1952), 7 p.m., KiMo.

March 6-17 — NM Repertory Theatre, "Cloud 9," Wed.-Sat. 8 p.m., Sat. & Sun., 2 p.m., KiMo, 243-4500.

March 8-9 — NMSO, guest trumpeter Rolf Smedvig, 8:15 p.m., Popejoy, 842-8565.

March 15 — Hard Hat Charity Ball, benefit for NM National Health Agencies, Ronald McDonald House, All Faiths Receiving Home, and Health Fair NM, American Warehouse Plus (801 Comanche NE), 7-10:30 p.m., tickets ($25/couple — all proceeds to charity), 883-2211.

Through May 12 — "IIKAAH: The Paintings that Heal," sandpainting drawings, symbols of healing and the primary artistic expression of 24 major Navajo ceremonials. Wheelwright Museum, 704 Camino Lejo, Santa Fe.

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2. One ad per issue per category.
3. Submit in writing. No phone-ins.
4. Use home telephone numbers.
5. For active and retired Sandians and DOE employees.
6. No commercial ads, please.
7. No more than two insertions of same ad.
8. Include name and organization.
9. Housing listed here for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

STENORETTE transcriber, reel-to-reel, w/foot control & headphones, $250. Chavez, 881-2711.

PATIO sliding glass door, 6', w/frame & screen, $40; 14 window screens; fluorescent light fixtures, 3-bulb. Aragon, 881-4795.

WATERBED, ¾ size, w/leak liner, bookcase headboard, heating pad w/control, drain, pump, $100. Hernandez, 268-5000.

WOOD stove, Roper catalytic, never used, demo in operation, $400; wood beams, 3 ea. 4"x10"x10', $30. Salmi, 294-3022.

POLAROID time-zero film for SX70 camera, two-pack, $10. Renschler, 293-5782.

NEED home for adult male stray cat, white w/gray. Douglas, 281-9504.

LIQUID embroidery, full set, $5; candle making kit, never used, $12; winter corduroy jacket, misses medium, $10. Johnson, 299-2186.

DEC VT180 computer w/4 drives, 64K, Z80, CP/M, lots of software, $1500 or trade. Neal, 292-8675.

ACCORDION, new, Italian-made, 120 bass, 10 stops. Johnson, 884-0690.

ARISTOCRAT travel trailer, 20', self-contained. Chavez, 298-1649.

KENWOOD transceivers: TS520S w/CW filter, speaker, mike, digital readout, $455; TS120S, mobile mount, mike, $345. Erni, 268-1721.

BASS guitar, w/case, Peavey, $250; bass guitar, Fender precision replica, Honer, $140. Ruiz, 831-3340.

SKI boots, men's 7½, Lange XLS, used 1½ seasons, $55. Kelly, 299-7190.

SOFA & loveseat, $150. Subramanian, 821-1705.

SPARE tire & wheel, 8.75x16.5, 8-hole, mounted & balanced. Hole, 255-1444.

TWO lots, Sandia Memory Gardens. Prusak, 298-7782.

SKI boots, Caber, ladies 7½, red, $35; Tomic ski poles, 48", $10. Poole, 298-6025.

MORGAN moveable shop building, 12x16, fully insulated, pegboard paneling, wired for 220, $3500. Olson, 298-3795.

GIBSON guitar, new, $500 OBO. Lovato, 247-4942 after 2 p.m.

2 TWIN box springs & frames, $75; 2 twin bed spreads & matching curtains, earthtone, $50. Wilder, 299-6198.

NEED home for 2 brown Dobermans about 2 yrs. old, male purebred (no papers) & female ½ Doberman. Jones, 281-5131.

BEDROOM furniture, complete set in Early American. Stewart, 298-3332.

'82 NU WA 19' travel trailer, $2K down, take up payments of $142.50. Wiggins, 295-0895 after 5.

CUSTOM stereo cabinet w/Ampex reel-to-reel recorder-player, Garrard turntable, 100 reel-to-reel tapes recorded in 1960s, $295. Newton, 296-2335.

CUSTOM Tex-Tan balanced ride western saddle, $425; custom ladies chaps, 10-12, never worn, $100; other tack available. Romine, 281-5682.

AIR compressor, new 1 HP Dayton motor, 12 gal. tank on wheels, pumps to 120 psi, $175. Martin, 869-2049.

FREE blue bathroom wall sink; speed bag w/wood platform, $10. Zirzow, 294-7296.

FREE to good home, watchdog, not good w/children. Boyd, 299-8523 after 5.

SOFA, loveseat, coffee table, end table, new, earthtones w/wicker, paid $1300, sell for $850 OBO. Baca, 299-4875.

TWIN box springs, mattress & frame, $50; 2 pick-up beds of scrap lumber, $60. Baker, 881-9439.

SKIS, Head standards, 205cm, $5; bindings, Soloman 444, $10. Dippold, 821-5750.

SEARS freezer, chest model, 9 cu. ft., $195 OBO; workbench w/pegboards, cabinets, drawers, $160 OBO. Holloway, 296-4916.

NINE rolls EL135-36, 1 roll EN135-36, $35. Miller, 255-7716.

MARIMBA, 4⅓ octave Musser Canterbury, only 60 made; Spalding golf clubs; lt. oak twin bed. Purdue, 256-0802 after 1.

YAMAHA console piano & bench, walnut finish, $2200; Brunswick air hockey, full size, $90. Gillen, 298-2282.

DISHWASHER, Kenmore, undercounter, motor needs repair, take away. Moss, 298-2643.

SUEDE jackets, ski bag; after-ski boots; ski tote w/lock; ski jacket; bib; hats; gloves; turtleneck. Kiro, 266-7605.

DINING room table, drop-leaf, walnut, 6 chairs, 2 leaves, $350. Foty, 268-0412.

PIANO, Steinway console, $3000. Crane, 1627 Propps NE.

KONICA 35mm "T" body, $50 OBO, Homestead style couch, chair, rocker, all $100. Greer, 296-7310.

CRAFTSMAN 2-stage oxy-acetylene welding unit w/utility truck for tanks, $200. Harstad, 298-6551.

BRONZE sliding glass door w/frame, $65; 24"x36" bathroom window, $10; 30" vanity w/marble sink & fixtures, $35; 24x24 bathroom mirror w/light & cabinet, $10. Greenholt, 294-5286.

REFRIGERATOR, Sears 14' white frostless, $210; water main key, $5; hi-intensity car light set, $10; electronic blood pressure kit, $15. Schubeck, 821-3133.

FREEZER, small, upright, $75 firm. Gallegos, 881-3289.

EARLY 70s Toyota Landcruiser shop manuals, $15; carburetor, bearings, other engine parts, $50 for all; Heathkit HW202 2m transceiver, $100. McFarland, 292-8136.

SOFA & matching love seat, earthtones, $300 for both. Keeler, 299-1542, 299-1501.

PORTABLE hot springs spa, 7'5"x7'5"x31". 275-gal. capacity, 2 yr., w/insulating cover, $2300. Haynes, 831-2019.

CANON FTb body, Canon 35mm f3.5 FD lens; Vivitar 20mm f3.8 FL lens w/Canon mount. Rodacy, 293-2668.

SCHWINN 3-wheeled bike, 3-spd., $90. Geck, 299-5095.

'72 TRAVEL trailer, Twilight Bungalow, 18½', fully self-contained, sleeps 6, many extras. $2750. Greenway, 299-8540.

QUEEN size sofabed, tweed; Ethan Allen maple coffee table, 2 end tables, corner desk & chair, bookcases. Rugh, 867-4143.

SIX 15" Klipsch La Scala speakers, for PA systems, sound systems, or instrument use, $350 ea. (negotiable). Mowry, 884-1853.

DRY BAR, includes stereo, AM-FM cassette, $150; kitchen set, 6 chairs, $200; coffee table, 2 end tables, commode, $175; Broyhill couch, $300. Filusch, 299-5932.

DINETTE table, 42" round w/2 leaves, 4 chairs, lt. wood grain Formica, $100; baby walker, Century Hulacoupe, $5. Bixler, 293-7205.

LOVE SEATS (two), heavy Spanish style, dark wood, gold cushions, $175/pr., $100 ea.; freezer, white GE, $120. Moore, 345-4030.

TRANSPORTATION

'77 DODGE van, V8, AT, PS, PB, CC, new tires, metallic blue, 9-passenger, $3500 OBO. Rutledge, 821-3048.

'79 CHEVELLE, 6-cyl., AT, new battery, 93K miles, $500. Conley, 298-7862.

'79 DATSUN 280ZX, 65K miles, AM/FM, AC, $7300. Smith, 281-2940.

'71 LINCOLN Mark III, leather interior, always garaged, 63K salt-free miles, new tires, dark green, $5000. Frederiksen, 7207 Dreyfuss, Amarillo, 79106, (806)-352-4620.

'74 MUSTANG hatchback, needs engine, $444 OBO. Andersen, 294-8624.

'80 FORD Pinto Runabout, 4-spd., AC, 35K miles, $2300. Kavet, 299-1793.

BMX bike, 20", Roger DeCoster mag wheels, $99. Mayer, 294-3368.

'72 WINNEBAGO class A, 24', rolled into lake — engine good, trans. & generator need repair, replace carpet, cushions. $7200. Hueter, 242-1620.

'71 PONTIAC Grand Ville, 4-dr., loaded, $800. Morrow, 281-3417.

'76 EL Camino w/shell, AC, PS, PB, CC, trailer hitch, 35K miles, $3500. Predika, 836-5804.

'84 FORD Tempo GL, AT, AC, 4-cyl., red w/red cloth interior, 9K miles. Creel, 294-1650.

'82 SCIROCCO, silver blue, 29K miles, AC, FM cassette, alloy wheels, & more, $7200. Kelly, 299-7190.

'80 KAWASAKI 1000 shaft, orig. owner, loaded for touring, $2500. Yip, 294-8124 after 5.

'72 FORD Courier pickup, rebuilt engine, new Holly carb, 4 new tires, new interior, shell, $925. Robb, 821-2999.

'47 STUDEBAKER pickup, orig. engine, $1500. Taylor, 345-7623.

'83 BAYLINER, 16', 85HP outboard, full canvas, upgrade trailer, power trim/tilt, depth finder, used twice, stored inside. Patton, 298-9987.

'84 VW Vanagon GL, water cooled, factory air, stereo, 18K miles, below book. Kessel, 266-2094.

BOAT & motor, Sears 12' Gamefisher, Johnson 6HP motor, canvas boat cover, oars, $900. Holmes, 292-0898.

'78 MERCEDES 450 SEL, 53K miles, $17,500. Jones, 255-7924.

'67 VW Bug, 80+K miles, $700. Landis, 296-9289.

SMALL 10-spd. bicycle, 24" tires, $125. Richards, 281-9471 after 5:30.

'75 HONDA CB360, low miles, $550; '77 Yamaha 100 Enduro, recent tune up, $325. Sanchez, 836-3615 after 6.

'76 PORSCHE 914, 2 liter, AC, AM/FM cass., 52K miles, $4600. Gibson, 298-9170.

'73 DODGE ¾-ton power wagon, low mileage, AC, AT, PS, PW, new tires, & brakes, w/camper shell. Randall, 821-0388.

'78 PONTIAC Sunbird, 4-cyl., 39K miles, PS, PB, AC, AT, $2850 OBO. Gendreau, 268-3436.

'80 YAMAHA SR250 Exciter, new seat, windshield, $600 OBO. McFarland, 292-8136.

MOTORCYCLE sidecar w/convert. top & mounts for Honda Goldwing, California Friendship model, under 300 miles, $1350 firm. Barnard, 831-4114.

'74 COLT 4-dr. sedan, 4-spd., 30 mpg, orig. owner, $500. Bixler, 293-7205.

'65 TRIUMPH TR4, wire wheels, new soft top, $2595. Stephenson, 296-9330.

FLATBED TRUCK w/side racks, '62 Chevy C-50, 12', 16,000-lb. gross vehicle weight, $2000. Kane, 881-7672.

REAL ESTATE

DUPLEX. Pimentel, 823-2934 after 6.

CHELWOOD/Lomas, 3-bdr., 2 bath, 1789 sq. ft., fp, views, dbl. gar., den, lg. util. rm., $89,900. Ontiveros, 292-6612.

CEDAR CREST, one acre, adjoins National forest, water system, pinon & juniper, 20 mins. to Sandia. Eagan, 281-9589.

3-BDR., carport, storage bldg., 1540 sq. ft., lg. lot, near Rio Grande HS, low 50s Reich, 877-2846.

APPROX. 1 acre lot in NW corner of Sandia Knolls Subdivision, just off Frost Rd., community water system, lot #209 on Lakeview Circle, $17K, terms. Watkins, 296-4324.

TRIPLEX, 3 blocks to UNM, 1-bdr., FHA appraised. Butler, 242-5398.

CORRALES building lots, 1-3 acres, utilities, irrigation, view. Hall, 822-0217.

NE, 2-bdr., 1¾ bath, dbl. garage, 2½ yrs. old, $81,500, assumable loan. Vigil, 296-7021 after 5.

WANTED

SOCCER coach for C-league, women's soccer team, evenings. Torres, 299-1879 or Chavez, 242-3265.

USED harp in good working condition, prefer pedal but will consider troubador. Hughes, 265-1698.

WOMEN'S ski wear, size 14: jump suit or stretch pants, need before March 4. Joseph, 299-6989.

'69-'72 CHEVY Blazer after market parts. Roll bar, lg. wheels & tires, axle trusses, suspension lift kit, etc. Snelling, 294-5751.

NONSMOKER to share house in NE: 3-bdr., 2 bath, 2-car gar., $250/mo. Martin, 292-6313.

23- or 24-FT. motor home in good condition, less than 4 yrs. old. Stoever, 296-3717.

Music Upstairs, Downstairs Tonight

MUSIC LOVERS of all kinds can enjoy the sounds at the Club tonight. Upstairs, the popular Isleta Poor Boys play their brand of country and western music. Downstairs, the resurrected Bob Banks Trio plays a quieter kind of music — show tunes and the ballads of yesterday. Manager Sal Salas promises that the El Dorado Room will offer full service — waitresses and bartenders — and the same menu as upstairs. The dining room special tonight is your choice of filet mignon or snow crab, two-for-one at $12.95. Call the Club office, 265-6791, *right now* about reservations.

VARIETY NIGHT TOMORROW now has a new name and a new format. The event is called Family Night and features an expanded buffet supper (selections for everyone at reasonable prices), live entertainment, and a movie. Admission is still free to members and families. Food service starts at 4:30. Between 4:30 and 5:30, Disney cartoons will be showing on the Club's big TV screen.

Entertaining tomorrow is a juggling comic called Pyro. He'll be on stage at 5:30 followed by a Walt Disney classic film, *Pollyanna*, starring Hayley Mills. Popcorn and soft drinks sell for 25 cents.

NEXT FRIDAY, March 8, Enchantment returns to the Coronado Club bandstand playing a variety of danceable new and old popular tunes, Latin music, and a little country and western. Drummer Paul Metoyer (3435) heads the group; his wife Patty handles vocals. The dining room offers two-for-one prime rib or fried shrimp for $11.95.

THE ORIGINAL IRISHMAN, Tommy Kelly (ret.), returns to the Club for a special St. Patrick's Day session on Saturday, March 16. Accompanied on piano by Bob Banks, Tommy will sing the songs of the old sod in a tenor voice that still fills the room. He'll help O'Brien, O'Conlon, and O'Gallegos in wearin' of the green. There'll be some green beer, special prices, and free munchies and goodies starting at noon. Tommy sings from 3 to 5 p.m. Charter members should remember Tommy as a former Club president and the leader of a popular dance band for many years.

THE SANDIA THUNDERBIRDS, retiree special interest group, meets at the Club on Monday, March 11, at 2 p.m. in the ballroom. Election of permanent officers is scheduled along with other business.

A card party is scheduled in the El Dorado room on Monday, March 18, at 10:30 a.m. Bring your own deck, plan to have lunch at the Club, then continue the games all afternoon.

Also scheduled on Saturday, April 27, is another dinner dance for the Thunderbirds. Last week's event drew a capacity crowd (more than 350) for dinner and dancing to Don Lesman's big band.

SANADO WOMEN meet at the Club on Tuesday, March 12, for a luncheon featuring Doug Ballard (ret.) as speaker. Doug, who has earned national recognition as a watercolorist, will discuss "Daring to be Different." A wine social, starting at 11:30, precedes the luncheon.

The Sanado art group will hang an exhibit of members' work at the Club on Monday evening to be on display through Tuesday.

For luncheon reservations, call Norma Goodwin, 294-6702, before March 7.

ATTENTION SINGLES — All singles who work on KAFB are cordially invited to stop by the Club after work on Thursday, March 14, for a get together. There'll be special drink prices, a free munchies and goodies spread, and music by Dunn's Dancing Machine.

CORONADO SKI CLUB'S next one-day trip to Taos is set Sunday, March 17. For $32 you get bus transportation, lift ticket, coffee, hot chocolate and doughnuts on the way up, and refreshments on the return trip. Call Carolyn Johnstone (2625), 4-6165, to sign up. There may also be room on a fly-up trip.

To make the Lake Tahoe ski excursion March 10-17, call Fred Schkade (2614) on 4-7462 right away. For Jackson Hole on March 24-31, call Joel Miller (1523) on 4-1775.

THE BIGGIE this month falls on Saturday, March 31. It's a buffet with a talent show on stage. Called the Family Fun Festival, the event offers prizes in several categories for talent show winners. Open to members and families, the competition will feature singers, dancers, musicians, clowns and comedians, jugglers, hula-hoopers, acrobats — anyone with a talent who can perform. Sign up right away at the Club office to compete. Prizes — $25 for first, dinner for two for second, and trophies for third — will be awarded in four categories.

The family buffet, with selections for everyone and prices designed for the family pocketbook, starts at 6 p.m. The show starts at 6:45.

PYRO, a musician who juggles and does funny things, performs at Family Night tomorrow at 5:30. Food service starts at 4:30 along with Disney cartoons on the Club's big TV screen. *Pollyanna*, a Disney film, will be shown on the big screen in the ballroom at 6 p.m. Admission is free to members and families.

ENCHANTMENT music makers feature Bob Ezell (ret.) on drums, Jules Yuska on keyboards, Patty Metoyer as vocalist, and Paul Metoyer (3435), drums. Not shown is Andy Harris, guitar.